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SUCCESS-FAILURE AND INTERPERSONAL
PERCEPTION OF TASK PERFORMANCE

BY

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A THESIS
SUBMITTED TO THE FACULTY OF GRADUATE STUDIES AND RESEARCH
IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE
OF DOCTOR OF PHILOSOPHY

DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA
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SUCCESS-FAILURE AND RETROSPECTIVE PERCEPTION OF TASK DIFFICULTY

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© JAMES W. VARGO

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DEPARTMENT OF EDUCATIONAL PSYCHOLOGY

EDMONTON, ALBERTA
SPRING, 1970

UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled "Success-Failure and Retrospective Perception of Task Difficulty" submitted by James W. Vargo in partial fulfilment of the requirements for the degree of Master of Education.

ABSTRACT

Sixty-four high school students were given a pretest set of five-letter anagrams, six of which were typed in upper case letters and six in lower case letters. One-half of the students failed on the upper case anagrams (upper case failure group), and the other half failed on the lower case anagrams (lower case failure group). Before attempting each of the last ten anagrams, subjects were asked to estimate their chances of success on an eleven-point scale, given only the knowledge of whether the upcoming anagram was typed in upper case or in lower case letters.

Upon completion of the pretest anagrams, all students were given a set of twenty moderately difficult five-letter anagrams, ten of which were presented in upper case letters and ten in lower case letters. After attempting each anagram, the students rated it for difficulty on a scale similar to the one used for the pretest estimates.

The main experimental hypothesis tested was that subjects would retrospectively rate failure-type anagrams higher in difficulty level than success-type anagrams; i.e., in the test condition, the upper case failure group would rate upper case anagrams as having been more difficult than lower case anagrams, and the lower case failure group would rate lower case anagrams as having been more difficult than upper case anagrams.

Two three-way and one four-way analysis of variance showed no statistical support for this hypothesis although clear substantiation was obtained for Feather's research reflecting the effect of past success and failure on perception of future tasks of a similar kind. The results also suggested that perhaps anagrams appear more difficult when presented in upper case letters than when presented in lower case letters.

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CHAPTER I

INTRODUCTION AND RELATED LITERATURE

I. GENERAL PROBLEM

Much research has explored the effect of expectancy on prospective perception of task difficulty. Such studies reveal that pretask sets markedly influence task performance (Shales, 1930; Rees and Israel, 1935; Mowrer, 1938; Mohsin, 1941). The present study follows investigations by Atkinson (1957, 1958, 1964, 1966), Feather (1959, 1961, 1963, 1966, 1968), Feather and Saville (1967), and particularly that of Vargo (1968). Its purpose is to determine whether subjects are influenced by pretask sets _after_ the task has been completed; that is, do such sets affect retrospective perception of task difficulty?

II. RESEARCH AND THEORY

Achievement Motivation

In an effort to develop a systematic method for measuring human motives, David McClelland and his associates adapted the technique advanced by H.A. Murray (1936, 1938). Encouraged by a preliminary study (Atkinson and McClelland, 1948) which showed that Murray's thematic apperceptive method was effective in measuring the motive to achieve, McClelland and his co-workers launched an extensive research

program to study need achievement (McClelland *et al.*, 1953; Atkinson, 1958; McClelland, 1961).

In a study reported by McClelland *et al.* (1953) it was found that persons having a high need achievement motive (as determined by the n Ach score on the Thematic Apperception Test) showed little tendency to work hard to complete a task when there was no expectancy that successfully completing the task would lead to feelings of accomplishment. However, when there was such an expectancy (as aroused by the instructions), high need achievers worked hard to complete the tasks.

Commenting on this finding, Atkinson reported:

> It thus appeared that the arousal of a tendency to approach success should be conceived as jointly determined by a disposition called the achievement motive ... and an expectancy that certain actions will lead to success.... (1964, p. 233).

Atkinson's Theory of Achievement Motivation

Atkinson (1964) argued that a theory of achievement motivation should take into account important situational factors. He saw such factors conceived in terms of two variables:

(1) The degree to which, in evaluating the task confronting him, the individual expects to complete it, i.e., whether he feels his performance will lead to successful goal attainment.

(2) The desirability of goal attainment, i.e., the

amount of incentive that goal attainment presents.

Atkinson (1966) postulated that motivation is a multiplicative function of the strength of motive (M), expectancy that the act will result in goal attainment (E), and value of the incentive (I). This is represented as: Motivation = f(M x E x I).

More specifically, Atkinson (1957, 1958) asserted that in any achievement situation two different motive tendencies are aroused: the tendency to achieve or approach success and the tendency to avoid failure.

The tendency to achieve success. The tendency to achieve success (Ts) is a multiplicative function of motive for success (Ms), subjective probability of expectancy of success (Ps), and the incentive value of success (Is). Thus for any given task, the strength of an individual's tendency to approach success on that task is represented as: Ts = Ms x Ps x Is. Ms is assumed to be a relatively stable personality characteristic which presents itself in any behavior situation.

Ps and Is are determined by the individual's past experience in tasks similar to the one he is presently confronting. Ps represents the subjective probability of succeeding at the task. When a task looks easy, Ps is high. Ps is assigned values ranging from zero (no chance of success) to one (certainty of success). For example, a very easy task might be given a value of .90, a very difficult one

a value of .10.

Atkinson further postulated that Is is an inverse linear function of Ps, i.e., Is = 1 - Ps. This means that the easier the task (and thus the greater the probability of success), the less the incentive value of completing the task. Consequently, when Ps is very low (say .10), task completion has a high Is (.90); and when Ps is high (.90), Is is low (.10). This relationship accounts for the finding that persons take greater pride in accomplishing a difficult task than they do in completing a simple one (Festinger, 1942; Lewin et al., 1944). A graphical depiction of the relationship between incentive value (Is) and probability of success (Ps), is presented in Figure 1.

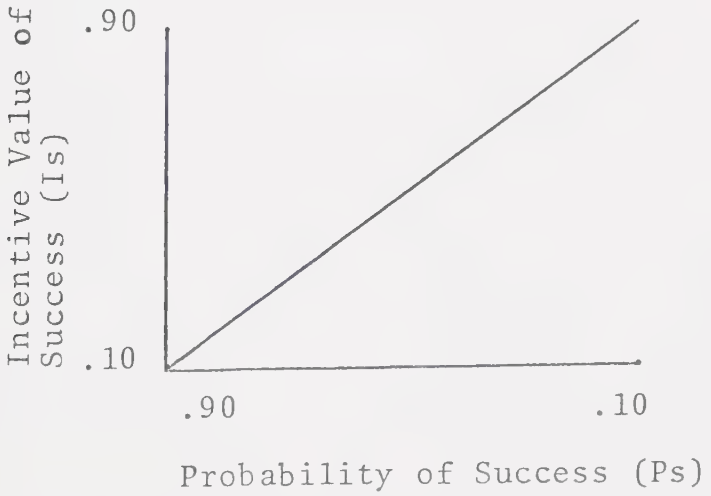

FIGURE 1

RELATIONSHIP BETWEEN INCENTIVE VALUE OF SUCCESS AND PROBABILITY OF SUCCESS

(Adapted from Souch, 1969, p. 10)

The tendency to avoid failure. According to Atkinson, in addition to a personally characteristic motive for success, everyone possesses a motive to avoid failure. He commented:

> Where the motive to achieve might be characterized as a capacity for reacting with pride in accomplishment, the motive to avoid failure can be conceived as a capacity for reacting with shame and embarrassment when the outcome of performance is failure (Atkinson, 1964, p. 244).

The tendency to avoid failure (Taf) is a joint function of motive to avoid failure (Maf), subjective probability of failure (Pf), and the negative incentive value of failure (If). For any given task the strength of an individual's tendency to avoid failure on that task is represented as: Taf = Maf x Pf x If. It is assumed that Pf = 1 = Ps.

The incentive value of failure (If) is equal to -Ps. For example, when a task is very easy (Ps = .90) the negative incentive value of failure for that task is very high (-.90). Likewise, when the task is an extremely difficult one (Ps = .10), the negative incentive value of failure is very low (-.10). (see Figure 2). This accounts for the finding that shame and embarrassment are greater in failing an easy task than in failing a difficult one (Festinger, 1942; Lewin, et al., 1944).

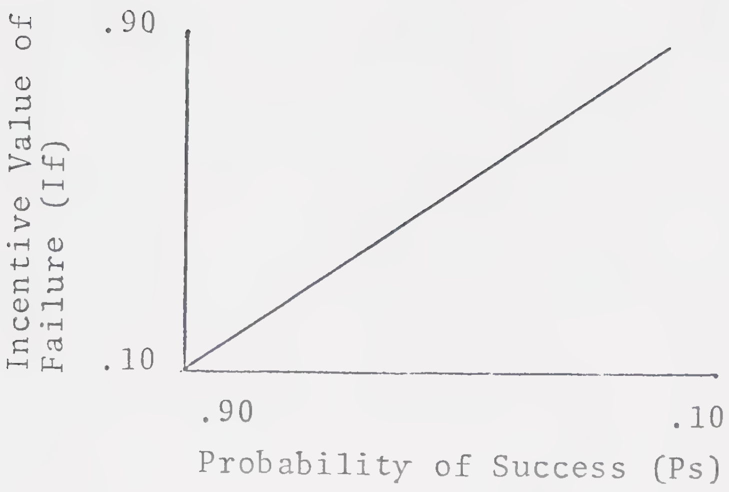

FIGURE 2

RELATIONSHIP BETWEEN INCENTIVE VALUE OF FAILURE AND PROBABILITY OF SUCCESS

(Adapted from Souch, 1969, p. 10)

Resultant Achievement Motivation. Since the motive to achieve success and the motive to avoid failure are present in every individual in an achievement situation, the resultant effect of these conflicting motivational influences is determined by taking the algebraic sum of Ts and Taf. Thus resultant motivation (Ta) is represented: $Ta = Ts + Taf$, or $Ta = (Ms \times Ps \times Is) + (Maf \times Pf \times If)$.

Implications of Atkinson's Theory

Atkinson's theoretical formulation has implications which have generated much fruitful research. For example, the equation $Ts = Ms \times Ps \times Is$ yields the greatest Ts when $Ps = .50$, i.e., when the task appears to be one of intermediate difficulty, and this substantially greater tendency

to achieve success when Ps = .50 is to be expected only when Ms is relatively strong. Among others, support for this implication has been presented by McClelland (1958) who found that kindergarten children high in n Ach selected a moderate distance from which to throw the ring in a ringtoss game.

Likewise, the equation Taf = Maf x Pf x If yields the greatest Taf when Pf = .50, and this substantially stronger tendency to avoid failure when Pf = .50 is to be expected only when Maf is relatively strong. The study by McClelland (1958) mentioned earlier also adds supporting evidence for this hypothesis.

According to Atkinson's theoretical formulation, then, the relationship between strength of motivation (either Ts or Taf) and probability of success can be described by a bell-shaped curve. (See Figure 3).

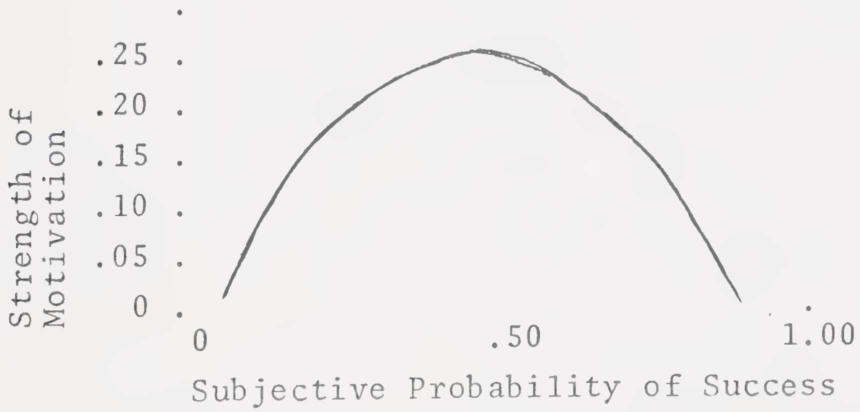

FIGURE 3

STRENGTH OF MOTIVATION TO ACHIEVE OR TO AVOID FAILURE AS A FUNCTION OF THE SUBJECTIVE PROBABILITY OF SUCCESS, I.E., THE DIFFICULTY OF THE TASK
(Atkinson, 1958, p. 330)

The main focus of research of this kind has been on the effects of Ms and Maf under conditions where values of Ps have been situationally evaluated. Recently, however, Norman T. Feather has directed his attention to determinants of Ps other than those in the immediate situation.

Success-Failure and Expectancy

In a study of persistence at a task, Feather (1961) postulated that total motivation must be considered as consisting of achievement related motivation (i.e., the algebraic resultant of Ts and Taf) plus extrinsic motivation (i.e., those motivational influences resulting from the fact that the subject is in a social situation which requires him to attempt the task). These experimental constraints in themselves have a motivating effect on the subject. This study used two kinds of subjects (those high in need achievement and low in test anxiety, and those low in need achievement and high in test anxiety) in each of two experimental conditions (high initial Ps, i.e., some Ps $>$ .50; and low initial Ps, i.e., some Ps $<$ .50). Strength of need achievement was determined by subjects' n Ach scores on the Thematic Apperception Test under neutral conditions, and level of test anxiety was determined by their scores on the Sarason Test Anxiety Questionnaire. Repeated failure on the initial task (which, in reality, was impossible) resulted in decreases in probability of success estimates for all four groups of subjects, indicating that rate of decrease of Ps is

independent of relative strength of Ms and Maf (Feather, 1961). This finding is consistent with that of another study which also found no statistically significant relationship between probability estimates and TAT n Ach scores (Feather, 1963), suggesting that the main determinant of Ps is past experience rather than Ms and/or Maf.

Further support for the determining effect of past experience on Ps was presented by Feather (1966) in a study which examined trial-by-trial changes in Ps in relation to the pattern of success and failure at a task consisting of fifteen anagrams. On the first five anagrams, one-half of the subjects failed (initial failure) and one-half succeeded (initial success). Before attempting each anagram, subjects were asked to rate their chances of success. Results showed that mean performance on the last ten anagrams (which were of 50 per cent difficulty) was significantly ($p < .01$) lower after initial failure than after initial success, and that the subjects' probability estimates (i.e., Ps) reflected the pattern of success and failure (Feather, 1966, p. 287).

Similar results were obtained in recent research by Feather and Saville (1967), and Feather (1968). These studies also showed that subjects who were successful at the first few items of an anagram-solving task subsequently were more successful on a common set of anagrams than subjects who were unsuccessful at the first few items. It

is quite clear, then that prior success or failure at a task does influence subsequent probability of success estimates and performance at the same kind of task.

Retrospective Perception of Task Difficulty

A study by Vargo (1968) employed Feather's finding (1961, 1966) that expectation of success diminishes with repeated failure at a task and increases with repeated success at a task. These results clearly show that repeated failure or success influences prospective perception of task difficulty. More specifically, the experimenter hypothesized that subjects experiencing pretask failure will, in the task condition, retrospectively perceive a failure-type task as having been more difficult than a success-type task; and similarly, subjects experiencing pretask success will, in the task condition, retrospectively perceive a success-type task as having been easier than a failure-type task.

In the above study fifty-two university freshmen were given a pretask set of ten square and ten circular geometric puzzles. One-half of the subjects failed on the circular puzzles (circle-failure group); the other half failed on the square puzzles (square-failure group). Upon completion of the pretask puzzles, all subjects were given another set of twenty puzzles ranging in difficulty level from extremely easy to extremely difficult. Ten of these puzzles were circular and ten were square, with each circular

puzzle having a square partner of equal difficulty, and vice versa. After attempting each puzzle, subjects rated it for difficulty level on an eleven-point scale.

The experimental hypothesis tested was that if expectancy (i.e., "mental set") affects perception of task difficulty after the task has been completed, then the circle-failure group should, in the task condition, rate the circular puzzles as having been more difficult than the square puzzles; and similarly, the square-failure group should rate the square puzzles as having been more difficult than the circular puzzles. However, analysis of variance showed results to be nonsignificant.

Discussion of Vargo's Investigation

The results obtained in Vargo's study do not support the hypothesis that subjects will retrospectively perceive a failure-type task as having been more difficult than a success-type task.

The most obvious explanation for these results is that the hypothesis is invalid. However, another possibility is that perhaps the hypothesis is correct but the procedure for testing it was faulty. For example, it may be that the pretask set inducing puzzles did not serve their purpose. If such was the case, then subjects should retrospectively perceive the puzzles of each pair as being of approximately equal difficulty. The data do seem to indicate that the partner puzzles of each matched pair were, upon

retrospection, perceived to be of equal, or approximately equal, difficulty. So maybe the subjects attempted the test puzzles with little or no pretask influence.

One conceivable reason for a failure of the set inducing puzzles to establish a pretask set is that perhaps the failure puzzles were readily perceived to be impossible. In one of his studies, Feather (1961) reports that the insoluble puzzles were sufficiently complex as to avoid detection of impossibility. However, the insoluble set inducing puzzles used in Vargo's experiment were more obviously impossible to solve according to the rules provided. If the subjects realized that the failure puzzles were insoluble, it seems likely that this would interfere with the expected set induction.

If the impossible puzzles were sufficiently complex, there seems little doubt that a mental set would have been established. For example, in one study Feather (1966) received trial-by-trial estimates of probability of success for fifteen anagrams. For one-half of the subjects the first five anagrams were insoluble (initial failure); for the other half of the subjects the first five anagrams were extremely easy (initial success). Mean estimates of probability of success showed that on each of trials two to five estimates given by subjects in the initial failure condition were repeatedly lower than those given on the previous trial. Similarly, estimates given by subjects in

the initial success condition were successively higher than those given on the previous trial (Feather, 1966, p. 290). This indicates, along with much of Feather's other work, that repeated success or failure at a task influences prospective perception of task difficulty. The knowledge that Vargo's study developed to this point would have been most helpful.

A study by Stewart (1967) does lend some support for this expectation, however. Using the same set inducing puzzles as did Vargo's investigation, Stewart found, in a resumption task, that subjects chose to resume puzzles similar to the ones they had succeeded on in the set inducing part of the experiment; that is, in the resumption task the circle-failure group chose square puzzles, and the square-failure group chose circular puzzles. Stewart states that although the study did not reveal the specific phenomenon responsible for their behavior, subjects did choose the expected puzzles. This evidence is quite indirect, but could reflect perception of task impossibility.

Another possibility is that although a differential set might have been established by the set inducing puzzles, it may have been neither strong enough nor of sufficient generality to override the effects of the experience of success and failure on the test puzzles.

III. THE PRESENT STUDY

The present study is basically a replication of Vargo's research described above. However, the methodology is revised considerably in an attempt to overcome the difficulties just discussed. The general hypothesis considered is that repeated failure or success influences retrospective perception of task difficulty. More specifically, it tests the hypothesis that subjects experiencing pretask failure will, in the task condition, retrospectively perceive a failure-type task as having been more difficult than a success-type task; and subjects experiencing pretask success will, in the task condition, retrospectively perceive a success-type task as having been easier than a failure-type task.

IV. IMPLICATIONS OF THE STUDY

The demonstration that repeated success or failure at a task influences both prospective and retrospective perception of task difficulty may have wide ramifications for education. For example, it will imply that a student who is taught Arithmetic by solving problems he can do easily might not only expect future Arithmetic problems to be easy but, after completing them, will perceive them to have been easier than will a student who was taught by attempting harder problems. In other words, a teaching method which employs tasks a student can do relatively

easily could be more effective in inducing favorable attitudes toward the subject matter than a method utilizing tasks the student finds difficult.

CHAPTER II

METHODOLOGY

I. SUBJECTS

Subjects were students enrolled in a high school psychology course (Psychology 20) at Queen Elizabeth Composite High School, Edmonton. The sample included students registered in academic and vocational programs. All subjects were either in Grade 11 or Grade 12, and participation was voluntary.

Two groups of subjects (N=117) were used. The first group, hereafter referred to as the criterion group, was comprised of forty-nine subjects (22 males, 27 females; mean age = 16.75 years; range = 16 - 19 years) and was used to determine which anagrams should be administered to the experimental, or test, group. (A more complete description of the anagrams is given in the following section.) The second group, hereafter called the test group, consisted of sixty-eight subjects (29 males, 39 females; mean age = 17.10 years; range = 16 - 19 years) and was used to test the experimental hypotheses to be outlined later.

II. THE TASK

Two groups of five letter anagrams were used in the

test condition: (1) a pretest, or set inducing, group of anagrams; and (2) a postset, or test group of anagrams. The set inducing anagrams were composed of two sets with twelve anagrams in each set. Moreover, each set of twelve contained six anagrams in upper case type and six in lower case type. Six of the set inducing anagrams were relatively easy to solve and six were very difficult. In one set the difficult anagrams were presented in upper case letters; in the other set they were typed in small case letters. As Feather demonstrated (1961, 1966, 1968), relative success in both types of anagram tasks can be manipulated by giving the subjects either the capital letter failure anagram set or the small letter failure anagram set. It is assumed that this relative success influences the perceived probability of success in future tasks of a similar kind. To check this assumption, the last ten set inducing anagrams were each preceded by an eleven-point rating scale. (The first two anagrams were not rated because they were included only to give the subjects some experience with anagram problems of different difficulty levels.) Before attempting each of the last ten anagrams the students were told, "The next one is typed in capital letters", or "The next one is typed in small letters", whichever was the case. With just this information to guide them, the subjects were required to check on the rating scale the point corresponding to their estimate of the chance of solving the following

anagram. This procedure provided a complete record of probability estimates for the pretest anagrams. Therefore, if subjects' estimates of success were significantly lower for failure anagrams than for success anagrams, it could be concluded that a prospective mental set had been established.

III. THE CRITERION GROUP

The anagrams were selected in the following manner: sixty 5-letter anagrams, some very easy (e.g. having many solutions), some very difficult (e.g. having only one uncommon word as the solution), and some moderately difficult were chosen from the list compiled by Olson and Schwartz (1967). Their list catalogues every English suffix, prefix, and word composed of five letters. The letter permutations chosen for the present study included only those whose solution was a meaningful English word with proper nouns excluded. The selected anagrams, presented in Appendix A, were administered in booklet form to the forty-nine students comprising the criterion group. Upon distribution of the booklets, the following instructions were given:

> The booklet you have been given contains a set of disarranged words called anagrams. Your task is to rearrange each group of letters to make a meaningful English word. Each anagram contains five letters and you must use each letter of the anagram. Therefore, every solution is a five-letter word. Proper nouns -- names of people or places -- are not acceptable. You will have twenty seconds to work at each anagram. Do

> not go on to the next one until so instructed. Are there any questions?

The difficulty level of each anagram was interpreted in terms of the percentage of subjects solving it (after Feather, 1966). The formula used was: % difficulty = 100 % - % of students solving the anagram. Thus an anagram that was solved by one-half of the students is of 50 % difficulty, one solved by 25 % of the students is of 75 % difficulty, etc. The six anagrams which the criterion group indicated were 21 % difficult or easier were used as the success set inducing anagrams, and the six that were 93 % difficult or harder became the failure set inducing anagrams. (The set inducing anagrams and their corresponding difficulty levels are recorded in Appendix B.) The twenty anagrams that were between 46 % and 72 % difficult were selected to comprise the postset of anagrams. These are also listed in Appendix B.

It was initially planned for the test group anagrams to be between 40 % and 60 % difficult. The original sixty anagrams were selected with this in mind; that is, the experimenter subjectively rated each anagram as he went along, attempting to include about fifteen very easy ones, fifteen very difficult ones, and thirty moderate ones. However, as can be seen from Figure 4, the students found the anagrams to be more difficult than the author had anticipated. To compensate for this skewness, the experimental group was allowed an extra five seconds solution time for each test

anagram.

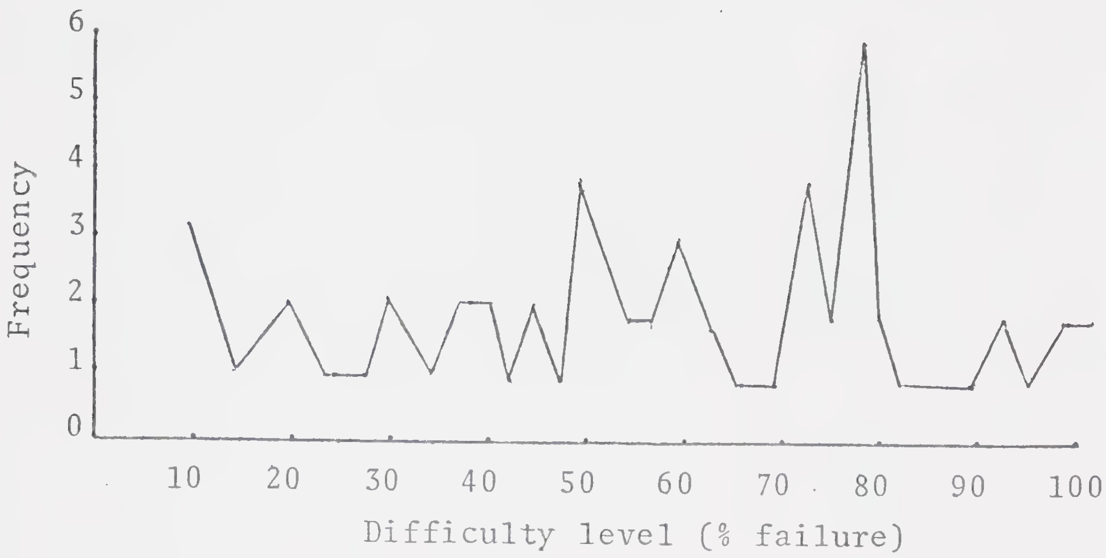

FIGURE 4

DISTRIBUTION SHOWING DIFFICULTY LEVELS FOR CRITERION GROUP ANAGRAMS

IV. THE TEST GROUP

The experiment proper was divided into two parts: (1) Part A, in which all subjects (68) were given the set inducing anagrams; and (2) Part B, in which the same subjects were given the test anagrams. Upon completion of Part A, the students immediately proceeded to Part B.

Part A. Each subject was given a booklet containing the set inducing anagrams with one anagram per page. Each of the last ten anagrams was preceded by a five-inch scale numbered from 0 to 100 in equal steps of 20 with the statement "No chance at all" at one extreme of the scale, the

statement "An even chance" at the middle of the scale, and the statement "Completely certain" at the other extreme of the scale. (See Appendix B).

One-half of the students received booklets with the failure anagrams in upper case type; the other half received booklets containing failure anagrams in lower case type. The odd numbered anagram in every booklet were typed in capital letters; the even numbered anagrams in small letters. Thus every booklet was ordered capital, small, capital, small ... capital, small. Furthermore, the anagrams were randomly ordered within this sequence so that at any one time different students were attempting different anagrams.

The following instructions were given:

> The booklet you have been given contains a set of disarranged words called anagrams. Some of the anagrams are typed in capital letters and some are typed in small letters. Your task is to rearrange each group of letters to make a meaningful English word. Each anagram contains five letters and you must use each letter in the anagram. Therefore, every solution is a five-letter word. Proper nouns -- names of people or places -- are not acceptable. You will have twenty-five seconds to work at each anagram. Are there any questions?
> Just for practice, when I tell you to start I want you to try the first two anagrams in the booklet. You will have twenty-five seconds for each one. After the first twenty-five seconds have expired, I will say "Turn to the next anagram". Do not go on to the second anagram until so instructed. Are there any questions?
> Ready -- start.
> (Subjects work at the first two anagrams.)

> Now, before you attempt each of the remaining anagrams, I want you to estimate your chances of success for each one. I will tell you whether the upcoming anagram is typed in capital or small letters and you are to estimate how difficult you think it will be using a rating scale like the one you see on the blackboard. (An example of Rating Scale A, as illustrated in Appendix B, was presented.) Notice that the ratings go from 0 to 100, and that the lower the rating, the better you think your chances are. If you are completely certain you can solve the next anagram, you rate your chance as 0; if you feel your chances are better than even you might make a rating of 30 or 40; and so on. A rating of 100 means that you think it will be impossible for you to complete the anagram. Are there any questions concerning the ratings? A scale such as this will be found preceding each of the remaining anagrams in Booklet A. Make your rating by circling the appropriate marking point on the scale. You will have five seconds to make your estimate and twenty-five seconds to attempt the anagram. Do not proceed to the next anagram until so instructed.
> Are there any questions?

After Part A was completed, materials for Part B were distributed and subjects immediately went on to Part B.

Part B. In Part B of the experiment, the students attempted the test anagrams. The task was the same as that in Part A, with one exception: the anagrams were rated after they were attempted. As before, the anagrams were presented in booklet form (Booklet B) with one anagram per page. All subjects attempted the same twenty anagrams, ten of which were randomly chosen from the twenty and delivered in upper case type, and the remaining ten in lower case type. Thus every subject received a different set of upper case

anagrams versus lower case anagrams. Again the order of presentation was capital, small, capital, small ... capital, small.

The following instructions were given:

> Your task in this part of the project is the same as that in Part A, with one exception: instead of rating your chances of success before attempting each anagram, you are to rate the anagram after completing it. You are to rate each anagram according to how difficult or easy it seemed to you. For this purpose, a rating scale such as this (Rating Scale B, such as illustrated in Appendix B, was drawn on the blackboard.) will follow every anagram in Booklet B. Note that there are six categories: Impossible, Extremely Difficult, Difficult, Moderate, Easy, and Extremely Easy. An anagram which cannot be solved, that is, you feel it is impossible to solve, would be given a rating of 100. An anagram which you found to be extremely difficult would be rated 90, one which was difficult would be rated 70, and so on. Make your rating by putting a circle around the appropriate marking point on the scale. Are there any questions?
>
> As before you will have twenty-five seconds to work on each anagram. As soon as you have finished it, turn to the following rating scale and circle the point corresponding to your judgement of the difficulty of the anagram. A five second period will follow each twenty-five second solution period to allow time for the rating in case you have not been able to complete it.
>
> Do not go on to the next anagram until so instructed. Are there any questions?
>
> Ready -- start on the first anagram.

V. EXPERIMENTAL DESIGN

Pretest Data

The pretest data involved four variables:

(1) Case (Upper case failure vs. lower case failure).

To control for possible differences between upper and lower case anagrams, approximately one-half of the subjects were given capital letter failure set inducing anagrams (C1 condition), and the other half received small letter failure set inducing anagrams (C2 condition). Thus about fifty per cent of the students attempted a pretest set influencing their prospective perception of task difficulty in one direction (i.e. "Upper case anagrams are difficult; lower case anagrams are easy"), while the rest of the students attempted a pretest set influencing their prospective perception in the opposite direction (i.e. "Lower case anagrams are difficult; upper case anagrams are easy").

(2) Quality (failure vs. success).

Each subject prospectively rated five failure anagrams (Q1 set) and five success anagrams (Q2 set).

(3) Trials (1-5).

The first two of the twelve anagrams in the pretest condition were presented to provide the students with some experience with anagram puzzles, prospective rating scores being acquired on the last ten anagrams only. Of these ten, the first success anagram and the first failure anagram were labelled T1, the second success and failure anagrams T2, etc., to T5.

(4) Sex (male vs. female).

The sample included both males (S1) and females (S2).

Two separate analyses were performed on the pretest data, one employing prospective rating scores, the other using performance scores. In the former, the variable Trials consisted of subjects' estimates of how well they would do on the forthcoming anagrams. In the latter, Trials referred to how well they actually did perform the anagram task, every success being recorded a 1, every failure a 0. The dependent variables were prospective ratings of anagram difficulty and number of anagrams solved, respectively. In each case, the resulting design was a 2 x 2 x 2 x 5 factorial with repeated measures on Q and T (Winer, 1962, p. 350).

Test Data

The test data also involved two designs, one using retrospective rating scores, the other using anagram performance scores.

Using Retrospective Rating Scores. The variables were:

(1) Case.

The test anagrams were rated by students who, in the pretest, had attempted the capital failure set inducing anagrams (C1), and by those who had previously attempted the

small failure set inducing anagrams (C2).

(2) Quality.

In the test condition each subject retrospectively rated ten failure-type anagrams (Q1), and ten success-type anagrams (Q2). For students who had attempted the capital letter failure set inducing anagrams in the pretest, failure-type anagrams were, again in the test condition, those presented in capital letters; and vice versa for subjects who had attempted the small letter failure set inducing anagrams.

(3) Trials.

There were ten trials, each trial consisting of the retrospective scores for one failure-type anagram and one success-type anagram.

(4) Sex.

This variable remained unchanged from the pretest data.

The dependent variable was subjects' retrospective ratings of anagram difficulty. The resultant design was a 2 x 2 x 2 x 10 factorial with repeated measures on Q and T (Winer, p. 350).

Using Performance Scores. The variables Case, Quality, and Sex were identical to those described above. Only Trials was different. Instead of using the retrospective rating scores for each trial, subjects' performance on the anagrams was used instead. Each correctly solved anagram was given a

score of 1; each unsolved anagram was recorded a 0.

These variables resulted in a 2 x 2 x 2 x 10 factorial design with repeated measures on Q and T (Winer, p. 350). The dependent variable was number of correct solutions.

VI. ANALYSIS OF THE DATA

Three main analyses were performed on the data: two three-way analyses of variance (Winer, p. 350), and one four-way analysis of variance (Winer, p. 350).

Analysis Number 1

The first analysis inspected the data from sixty-four subjects, considering the variables Case, Quality, and Trials. (The data from four students was randomly discarded to obtain equal numbers in each cell. Thus the computation was greatly simplified.)

Analysis Number 2

Results of the first analysis showed that subjects did not retrospectively perceive failure-type anagrams to have been more difficult than success-type anagrams. The effect could have been contaminated by the fact that many of the students did not obtain a prospective mental set (as indicated by prospective ratings) in Part A of the experiment. Therefore, a three-way analysis of variance was performed using the data of only those subjects who had

obtained such a set. (Prospective mental set was operationally defined as the mean prospective failure rating score being ten points or more higher than the mean prospective success rating score, i.e. Q1 - Q2 $>$ 10.) From the twenty-seven students who did obtain a prospective mental set, the data of three were randomly discarded, leaving N=24 with equal numbers in each Case x Quality group. The mean prospective rating scores for failure-type and success-type anagrams of these twenty-four subjects are presented in Appendix C.

Analysis Number 3

The third main analysis used the same subjects as Analysis Number 1 except that a number of female students were randomly discarded to allow equal numbers of males and females, and simplify further analysis involving sex differences, i.e. the data were analyzed in terms of Case, Quality, Trials, and Sex (N=48).

Supplementary Analysis

To determine whether the set inducing anagrams had any relation to subjects' perception of difficulty during the initial trial of Part B, Pearson Product Moment Correlation Coefficients (Ferguson, 1966, p. 111) were computed for the following sets of data:

Part A Data	correlated with	Part B Data
1. Rating on last success anagram	--	Rating on first success-type anagram
2. Rating on last success anagram	--	Rating on first failure-type anagram
3. Rating on last failure anagram	--	Rating on first success-type anagram
4. Rating on last failure anagram	--	Rating on first failure-type anagram
5. Rating on last success anagram	--	Performance on first success-type anagram
6. Rating on last success anagram	--	Performance on first failure-type anagram
7. Rating on last failure anagram	--	Performance on first success-type anagram
8. Rating on last failure anagram	--	Performance on first failure-type anagram

These eight correlations were calculated for three sets of subjects: those in which Q1 - Q2 for Part A ratings was $\geq$ 10 (called "good" group); those in which Q1 - Q2 for Part A ratings was $<$ 10 (called "bad" group); and for all the subjects (total group). This resulted in twenty-four correlation coefficients.

VII. HYPOTHESES

Four hypotheses were tested, two concerning the pretest data and two involving the test data.

Pretest Data

(1) Subjects will prospectively rate failure

anagrams higher in difficulty level than success anagrams.

(2) More success than failure anagrams will be solved.

Test Data

(3) Subjects will retrospectively rate failure-type anagrams higher in difficulty than success-type anagrams. This was the main experimental hypothesis.

(4) Subjects will solve more success-type anagrams than failure-type anagrams.

CHAPTER III

RESULTS

The findings will be presented first in terms of the statistically significant ($p < .05$) effects for each of the main analyses, and then summarized according to the experimental hypotheses outlined in the last chapter.

I. ANALYSIS NUMBER 1

The results of the first three-way analysis of variance are summarized in Tables I to IV inclusive.

Table I refers to the analysis of the students' prospective ratings, or estimates of success, and shows one main effect and two interaction effects to be statistically significant. The main effect (Quality) indicated that the group as a whole expected failure anagrams to be significantly more difficult than success anagrams. The interaction effect of Trial x Case, diagrammed in Figure 5, reflects the fact that on the initial trial subjects receiving the upper-case-failure-lower-case-success combination of anagrams (C1) expected future anagrams to be more difficult than did subjects receiving the lower-case-failure-upper-case-success combination (C2). However, from trials two to five prospective difficulty ratings by the C1 group gradually decreased (except for trial three), while those by the

C2 group generally increased (except for trial four). At the end of trial five the initial positions were markedly reversed, i.e. the C2 group anticipated future anagrams to be much more difficult than did the C1 group. The other significant interaction, Trial x Quality (Figure 6), showed that failure anagram ratings increased in difficulty level over trials, and success anagram ratings decreased in difficulty level over trails. Figure 6 reflects the build-up over trials of divergent expectations, culminating, on trial five, in a pronounced prospective mental set (i.e. Q1 difficulty ratings $>$ Q2 difficulty ratings).

Analysis of performance on Part A (Table II) resulted in a significant Quality effect (students solved more success than failure anagrams) and a significant Trial x Quality interaction (while performance gradually increased on the success anagrams, it first tended to worsen, then improved for the failure anagrams -- see Figure 7).

For the Part B data there were no significant effects on ratings (Table III), and only one on performance (Table IV). This was the main effect Trials represented in Figure 8. However, although there was a significant main effect, tests for linear trend, quadratic trend, and cubic trend (Winer, 1962, p. 73) indicated very little relationship between trials and mean proportion of anagrams solved (Table V).

TABLE I

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 1
PART A RATINGS
(N=64)

Source	SS	df	MS	F	P
Between Subjects:					
C	10.764	1	10.764	0.684	NS
C x subj. w. groups	976.400	62	15.748		
Within Subjects:					
T	12.444	4	3.111	1.650	NS
TC	35.337	4	10.764	5.710	.001
T x subj. w. groups	467.410	248	1.885		
Q	256.290	1	256.290	19.742	.001
QC	34.689	1	34.689	2.672	NS
S x subj. w. groups	804.910	62	12.982		
TQ	68.063	4	17.016	7.177	.001
TQC	7.506	4	1.877	0.791	NS
TS x subj. w. groups	588.020	248	2.371		
Total	3261.800	639			

TABLE II

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 1
PART A PERFORMANCE
(N=64)

Source	SS	df	MS	F	P
Between Subjects:					
C	0.255	1	0.255	2.475	NS
C x subj. w. groups	6.391	62	0.103		
Within Subjects:					
T	0.838	5	0.168	1.835	NS
TC	0.167	5	0.033	0.365	
T x subj. w. groups	28.328	310	0.091		
Q	123.520	1	123.520	1,431.000	.001
QC	0.130	1	0.130	1.509	NS
S x subj. w. groups	5.349	62	0.086		
TQ	0.995	5	0.199	2.390	.05
TQC	0.198	5	0.040	0.475	NS
TS x subj. w. groups	25.808	310	0.083		
Total	191.980	767			

TABLE III

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 1 PART B RATINGS (N=64)

Source	SS	df	MS	F	P
Between Subjects:					
C	2.363	1	2.363	0.064	NS
C x subj. w. groups	2286.660	62	36.882		
Within Subjects:					
T	65.720	9	7.302	1.000	NS
TC	47.770	9	5.308	0.727	NS
T x subj. w. groups	4073.800	558	7.301		
Q	0.657	1	0.657	0.064	NS
QC	25.595	1	25.595	2.508	NS
S x subj. w. groups	632.600	62	10.203		
TQ	64.195	9	7.133	1.054	NS
TQC	70.413	9	7.824	1.156	NS
TS x subj. w. groups	3776.800	558	6.768		
Total	11047.000	1279			

TABLE IV

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 1 PART B PERFORMANCE (N=64)

Source	SS	df	MS	F	P
Between Subjects:					
C	2.032	1	2.032	2.417	NS
C x subj. w. groups	52.117	62	0.841		
Within Subjects:					
T	3.835	9	0.426	2.031	.05
TC	3.460	9	0.384	1.833	NS
T x subj. w. groups	117.051	558	0.210		
Q	0.001	1	0.001	0.003	NS
QC	0.038	1	0.038	0.144	NS
S x subj. w. groups	16.511	62	0.266		
TQ	2.054	9	0.228	1.046	NS
TQC	1.173	9	0.130	0.597	NS
TS x subj. w. groups	121.717	558	0.218		
Total	319.990	1279			

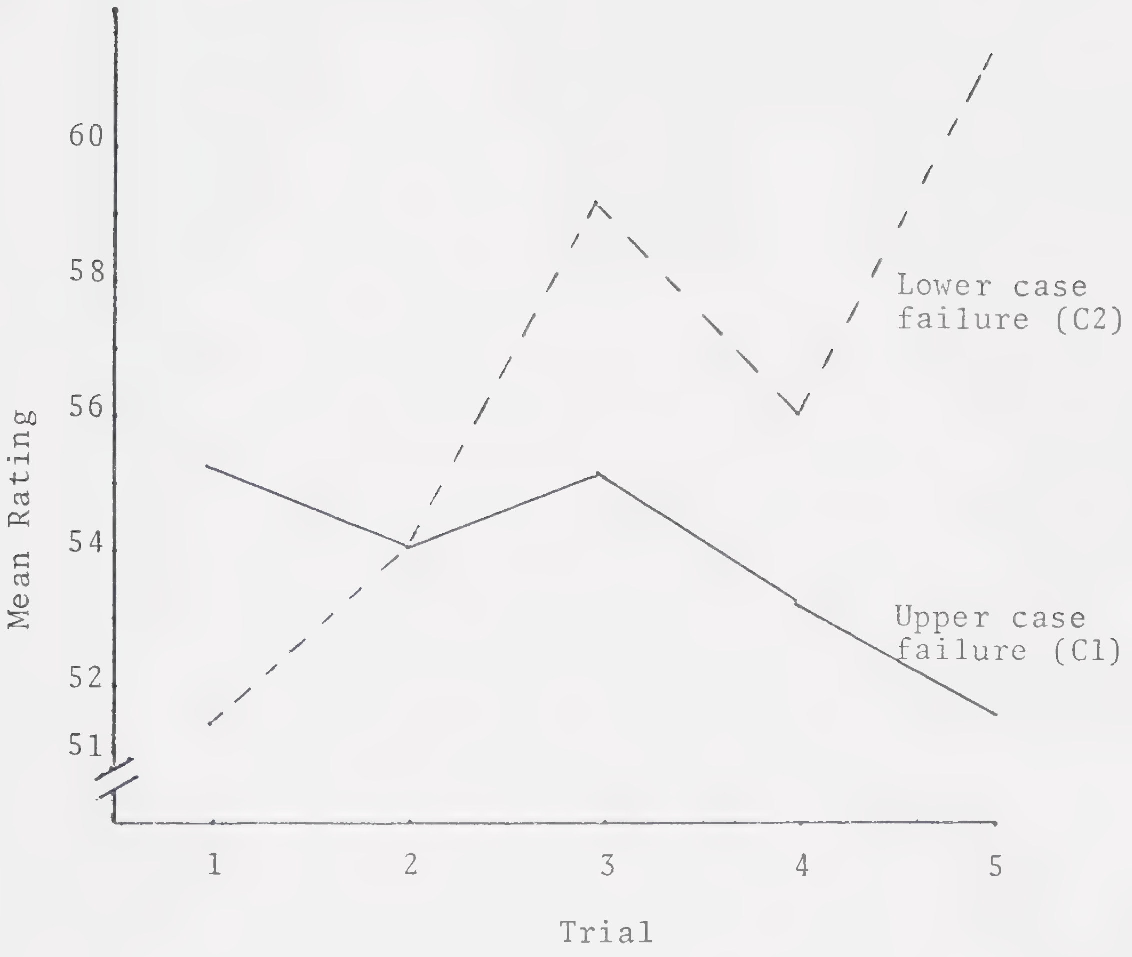

FIGURE 5

GRAPHICAL DEPICTION OF INTERACTION BETWEEN TRIAL AND CASE (TC) FOR PART A RATINGS, ANALYSIS NUMBER 1 (N=64)

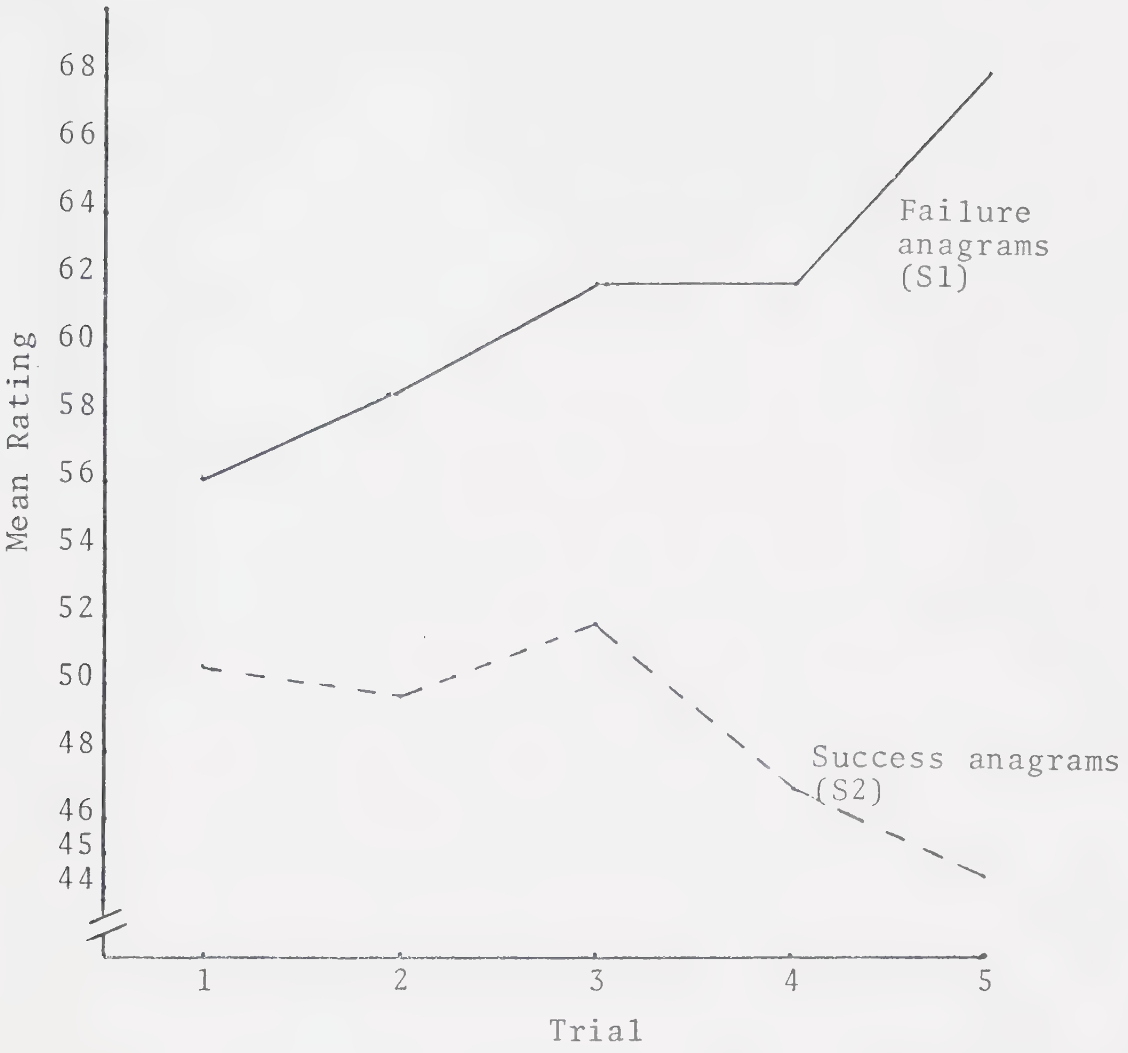

FIGURE 6

GRAPHICAL REPRESENTATION OF TRIALS X QUALITY (TQ) INTERACTION, PART A RATINGS, ANALYSIS NUMBER 1 (N=64)

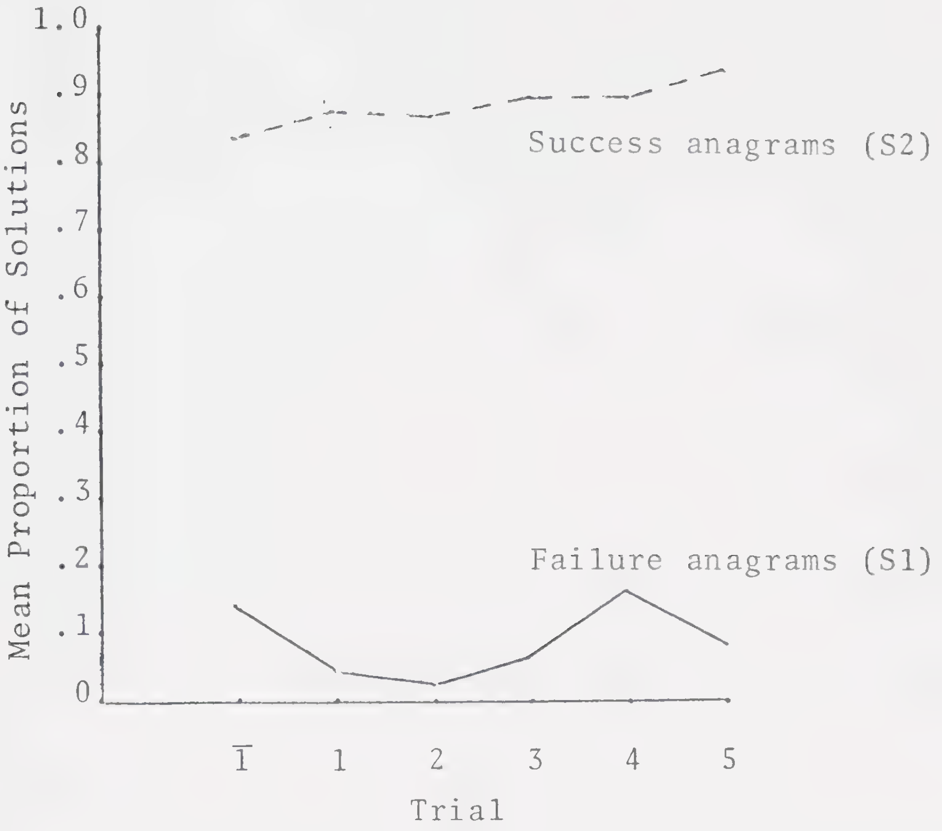

FIGURE 7

INTERACTION OF TRIALS X QUALITY (TQ) FOR PART A PERFORMANCE, ANALYSIS NUMBER 1 (N=64)

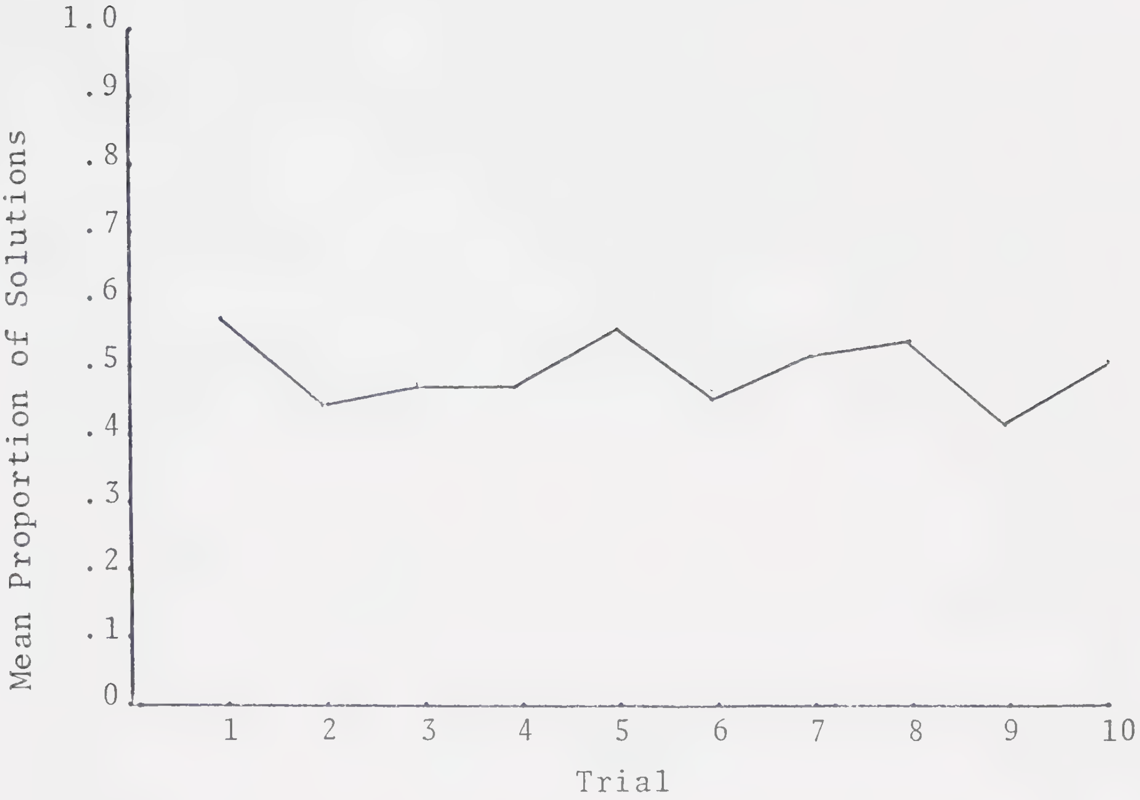

FIGURE 8

TRIAL (T) MAIN EFFECT FOR PART B PERFORMANCE, ANALYSIS NUMBER 1 (N=64)

TABLE V

SUMMARY OF TESTS FOR TREND ANALYSIS NUMBER 1 PART B PERFORMANCE (N=64)

Test	Mean Square	Calculated F	Critical F	P
Linear Trend	.132	.628	3.84	NS
Quadradic Trend	.063	.300	3.84	NS
Cubic Trend	.074	.352	3.84	NS

Mean Square Residual = .210.

II. ANALYSIS NUMBER 2

The second three-way analysis of variance, examining only the data of those subjects who had acquired a prospective mental set in the right direction, is condensed in Tables VI to IX inclusive.

Table VI reflects two significant effects for Part A rating scores: a Quality main effect (which was even stronger than in Analysis Number 1 due to the selection of subjects on this variable), and a Trial x Quality interaction (nearly identical to that of Analysis Number 1).

Similarly, significant results occurred on Quality and Trial x Quality for Part A performance (see Table VII).

As shown in Table VIII, the only significant finding for Part B ratings was a Trial x Quality interaction. Figure 9 demonstrates that, generally speaking, while mean

TABLE VI

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 2
PART A RATINGS
(N=24)

Source	SS	df	MS	F	P
Between Subjects:					
C	0.704	1	0.704	0.069	NS
C x subj. w. groups	223.800	22	10.173		
Within Subjects:					
T	16.225	4	4.056	1.905	NS
TC	17.358	4	4.340	2.038	NS
T x subj. w. groups	187.417	88	2.130		
Q	670.000	1	670.000	80.857	.001
QC	21.004	1	21.004	2.535	NS
S x subj. w. groups	182.296	22	8.286		
TQ	48.308	4	12.077	5.208	.001
TQC	7.808	4	1.952	0.842	
TS x subj. w. groups	204.082	88	2.319		
Total	1,579.000	239			

TABLE VII

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 2
PART A PERFORMANCE
(N=24)

Source	SS	df	MS	F	P
Between Subjects:					
C	0.125	1	0.125	1.467	NS
C x subj. w. groups	1.875	22	0.085		
Within Subjects:					
T	0.458	5	0.092	1.076	NS
TC	0.167	5	0.033	0.391	NS
T x subj. w. groups	9.375	110	0.085		
Q	50.000	1	50.000	665.513	.001
QC	0.139	1	0.139	0.185	NS
S x subj. w. groups	1.653	22	0.751		
TQ	0.792	5	0.158	2.344	.05
TQC	0.111	5	0.022	0.329	NS
TS x subj. w. groups	7.430	110	0.068		
Total	72.000	287			

TABLE VIII

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 2
PART B RATINGS
(N=24)

Source	SS	df	MS	F	P
Between Subjects:					
C	9.633	1	9.633	0.368	NS
C x subj. w. groups	575.540	22	26.161		
Within Subjects:					
T	39.492	9	4.388	0.631	NS
TC	48.158	9	5.351	0.770	NS
T x subj. w. groups	1376.540	198	6.952		
Q	0.300	1	0.300	0.026	NS
QC	8.533	1	8.533	0.738	NS
S x subj. w. groups	254.370	22	11.562		
TQ	132.160	9	14.684	2.174	.05
TQC	38.258	9	4.251	0.629	NS
TS x subj. w. groups	1337.380	198	6.754		
Total	3820.300	479			

TABLE IX

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 2
PART B PERFORMANCE
(N=24)

Source	SS	df	MS	F	P
Between Subjects:					
C	1.102	1	1.102	1.708	NS
C x subj. w. groups	14.196	22	0.645		
Within Subjects:					
T	2.585	9	0.287	1.483	NS
TC	1.919	9	0.213	1.101	NS
T x subj. w. groups	38.346	198	0.194		
Q	0.052	1	0.052	0.188	NS
QC	0.102	1	0.102	0.368	NS
S x subj. w. groups	6.096	22	0.277		
TQ	3.052	9	0.339	1.327	NS
TQC	1.585	9	0.176	0.689	NS
TS x subj. w. groups	50.613	198	0.256		
Total	119.650	479			

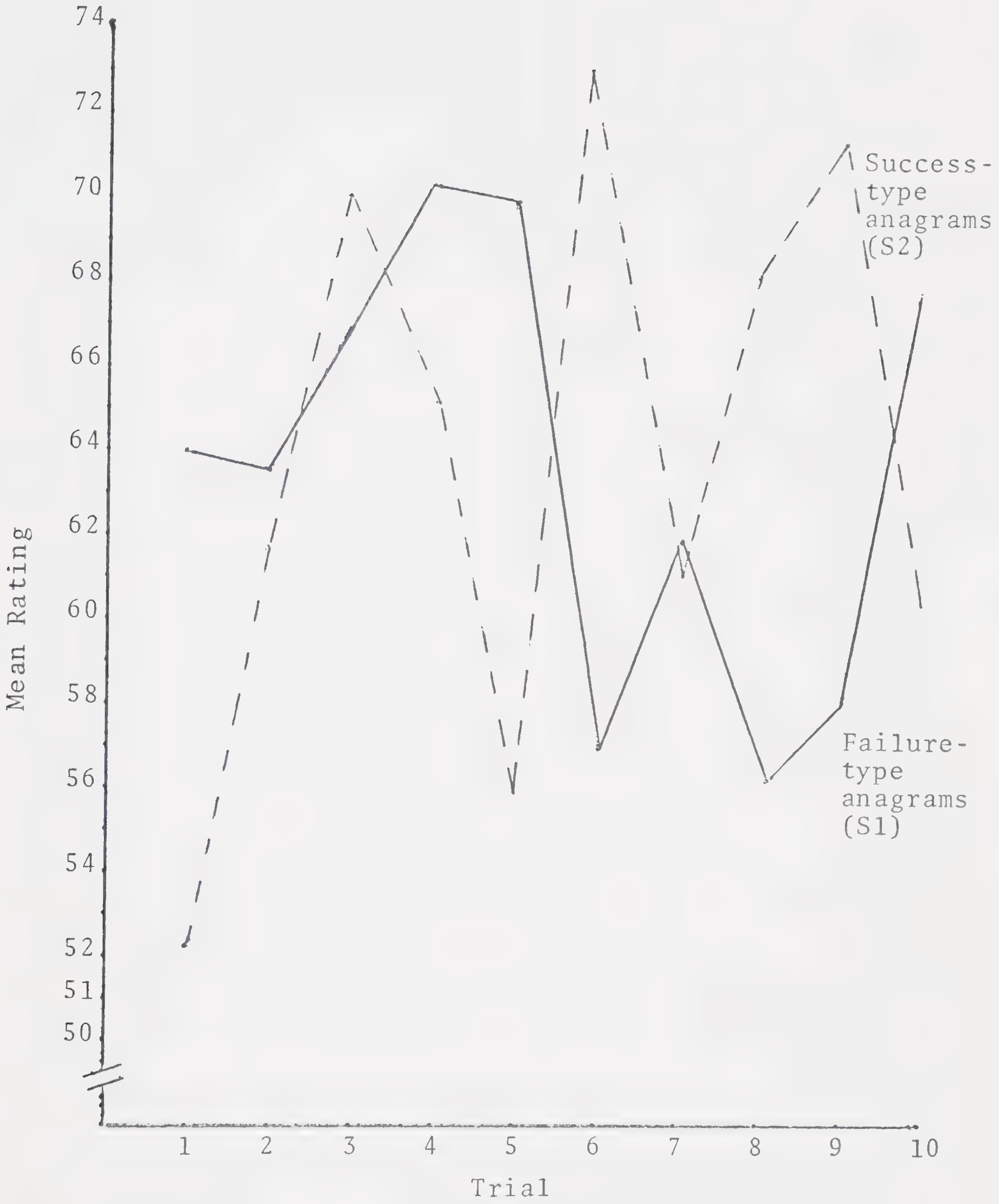

FIGURE 9

GRAPHICAL REPRESENTATION OF TRIALS X QUALITY (TQ) INTERACTION FOR PART B RATINGS, ANALYSIS NUMBER 2
(N=24)

difficulty ratings for the success-type anagrams tended to increase over trials, those for the failure-type anagrams tended to decrease.

Table IX shows that for the Part B performance data all effects were nonsignificant.

III. ANALYSIS NUMBER 3

The four-way analysis of variance applied to the data considered the additional variable of sex. The findings from this analysis are summarized in Tables X to XIII inclusive. Most of the resulting significant effects were the same as those found in Analysis Number 1, which is to be expected since the forty-eight subjects comprising the third sample were drawn from the first and divided according to sex.

For Part A ratings (Table X), there were no significant sex effects.

The Part A performance data (Table XI) exhibited two significant sex interaction findings. The Sex x Quality interaction, presented in Figure 10, shows that males tended to solve more failure anagrams than did females, but females solved more success anagrams than did males. This suggests some possible assymmetries in the effect of Ps on achievement motivation for sex, namely that perhaps females perform better (i.e. have a higher Ts) when $Ps > .50$ while males may do better when $Ps < .50$. Figure 11, representing

the Trials x Sex x Quality interaction effect, for the most part supports the preceding result and adds to it the finding that on the success anagrams the males generally tended to improve their performance on each successive trial, while the performance of the females generally remained the same or worsened. On the failure anagrams, the males bettered the females on the first trial, then tended to underperform them on the next four trials and equalled them on the last trial.

The only significant effect for Part B ratings (Table XII) was the interaction of Quality x Case. As displayed in Figure 12 the results show that subjects who received the failure-type set of anagrams presented in upper case type retrospectively rated them as having been more difficult than did subjects who received them in lower case type; and subjects who were given the success-type anagrams in upper case letters retrospectively rated them as having been harder than did subjects who received them in lower case letters. That is, subjects found the capital letter anagrams to have been more difficult than the small letter anagrams. It should be mentioned here that this effect was significant only in the third analysis; hence it is probably weak.

Table XIII presents the findings for the Part B Performance data. All results were nonsignificant.

The significant findings for each of the three analyses of variance are abridged in Table XIV.

TABLE X

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 3
PART A RATINGS
(N=48)

Source	SS	df	MS	F	P
Between Subjects:					
C	8.802	1	8.802	0.583	NS
S	2.269	1	2.269	0.150	NS
CS	0.602	1	0.602	0.040	NS
Subj. w. groups	664.066	44	15.092		
Within Subjects:					
T	11.325	4	2.831	1.461	NS
TC	20.875	4	5.219	2.692	.05
TS	10.033	4	2.508	1.294	NS
TCS	11.033	4	2.758	1.423	NS
T x subj. w. groups	341.134	176	1.938		
Q	169.220	1	169.220	13.144	.001
QC	36.852	1	36.852	2.862	NS
SQ	0.469	1	0.469	0.036	NS
SCQ	11.719	1	11.719	0.910	NS
S x subj. w. groups	566.453	44	12.874		
TQ	36.292	4	9.073	4.688	.001
TQC	11.152	4	2.790	1.441	NS
TSQ	5.333	4	1.333	0.689	NS
TSCQ	17.417	4	4.354	2.250	NS
TS x subj. w. groups	340.597	176	1.935		
Total	2265.600	479			

TABLE XI

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 3 PART A PERFORMANCE (N=48)

Source	SS	df	MS	F	P
Between Subjects:					
C	0.210	1	0.210	1.796	NS
S	0.210	1	0.210	1.796	NS
CS	0.016	1	0.016	0.134	NS
Subj. w. groups	5.146	44	0.117		
Within Subjects:					
T	0.759	5	0.152	1.507	NS
TC	0.259	5	0.052	0.514	NS
TS	0.217	5	0.043	0.431	NS
TCS	0.536	5	0.107	1.066	NS
T x subj. w. groups	22.146	220	0.101		
Q	87.891	1	87.891	1094.124	.001
QC	0.085	1	0.085	1.059	NS
SQ	0.391	1	0.391	4.863	.05
SCQ	0.016	1	0.016	0.195	NS
S x subj. w. groups	3.535	44	0.080		
TQ	1.036	5	0.207	2.270	.05
TQC	0.134	5	0.027	0.293	NS
TSQ	1.036	5	0.207	2.270	.05
TSCQ	0.286	5	0.057	0.627	NS
TS x subj. w. groups	20.090	220	0.091		
Total	144.000	575			

TABLE XII

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 3
PART B RATINGS
(N=48)

Source	SS	df	MS	F	P
Between Subjects:					
C	1.504	1	1.504	0.041	NS
S	66.150	1	66.150	1.796	NS
CS	7.704	1	7.704	0.209	NS
Subj. w. groups	1620.870	44	36.838		
Within Subjects:					
T	39.921	9	4.436	0.661	NS
TC	40.308	9	4.479	0.667	NS
TS	20.121	9	2.236	0.333	NS
TCS	78.942	9	8.771	1.306	NS
T x subj. w. groups	2659.190	396	6.715		
Q	1.067	1	1.067	0.121	NS
QC	47.704	1	47.704	5.416	.05
SQ	0.017	1	0.017	0.002	NS
SCQ	10.004	1	10.004	1.136	NS
S x subj. w. groups	387.512	44	8.807		
TQ	32.454	9	3.606	0.558	NS
TQC	35.858	9	3.984	0.617	NS
TSQ	42.504	9	4.723	0.731	NS
TSCQ	54.142	9	6.016	0.931	NS
TS x subj. w. groups	2557.670	396	6.459		
Total	7703.600	959			

TABLE XIII

SUMMARY OF ANALYSIS OF VARIANCE: ANALYSIS NUMBER 3 PART B PERFORMANCE (N=48)

Source	SS	df	MS	F	P
Between Subjects:					
C	1.667	1	1.667	1.936	NS
S	1.204	1	1.204	1.399	NS
CS	0.017	1	0.017	0.019	NS
Subj. w. groups	37.875	44	0.861		
Within Subjects:					
T	2.129	9	0.237	1.132	NS
TC	2.500	9	0.278	1.329	NS
TS	0.712	9	0.079	0.379	NS
TCS	2.067	9	0.230	1.098	NS
T x subj. w. groups	82.791	396	0.209		
Q	0.017	1	0.017	0.064	NS
QC	0.204	1	0.204	0.781	NS
SQ	0.267	1	0.267	1.020	NS
SCQ	0.004	1	0.004	0.016	NS
S x subj. w. groups	11.508	44	0.262		
TQ	1.608	9	0.179	0.769	NS
TQC	0.754	9	0.084	0.361	NS
TSQ	1.691	9	0.188	0.809	NS
TSCQ	0.954	9	0.106	0.456	NS
TS x subj. w. groups	99.992	396	0.232		
Total	239.960	959			

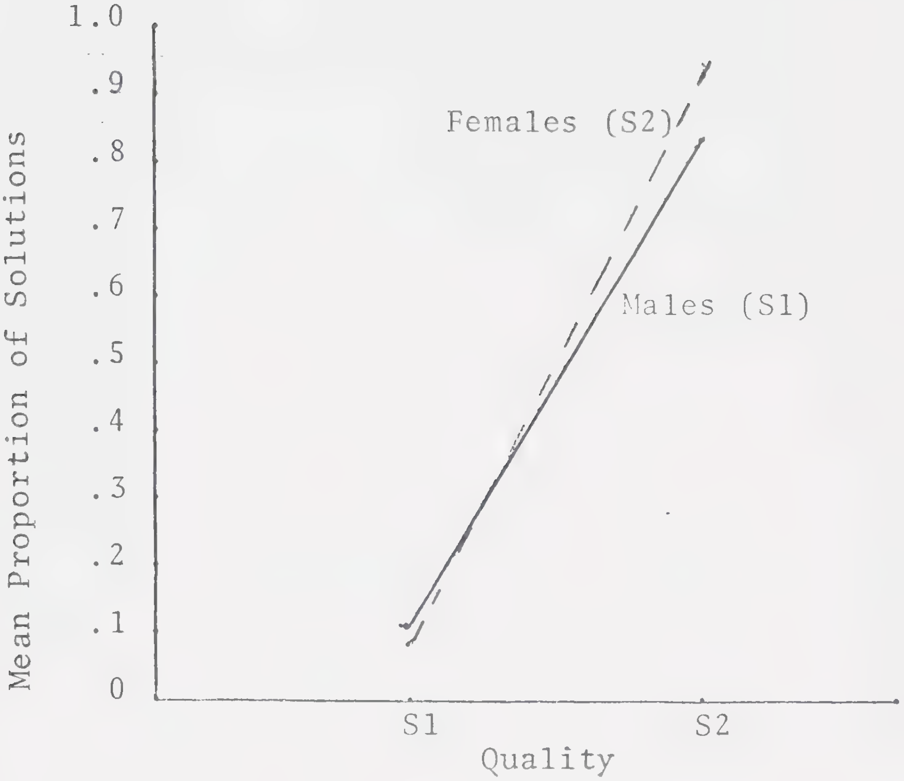

FIGURE 10

SEX X QUALITY (SQ) INTERACTION, PART A PERFORMANCE,
ANALYSIS NUMBER 3
(N=48)

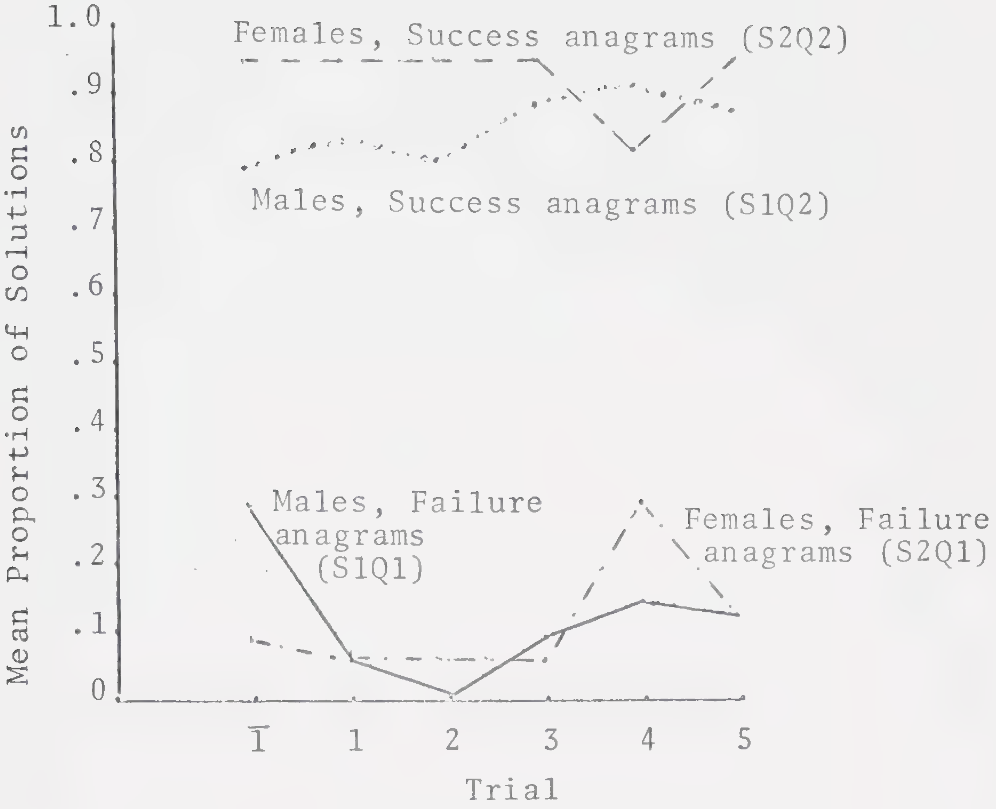

FIGURE 11

INTERACTION OF TRIALS X SEX X QUALITY (TSQ) FOR PART A PERFORMANCE, ANALYSIS NUMBER 3
(N=48)

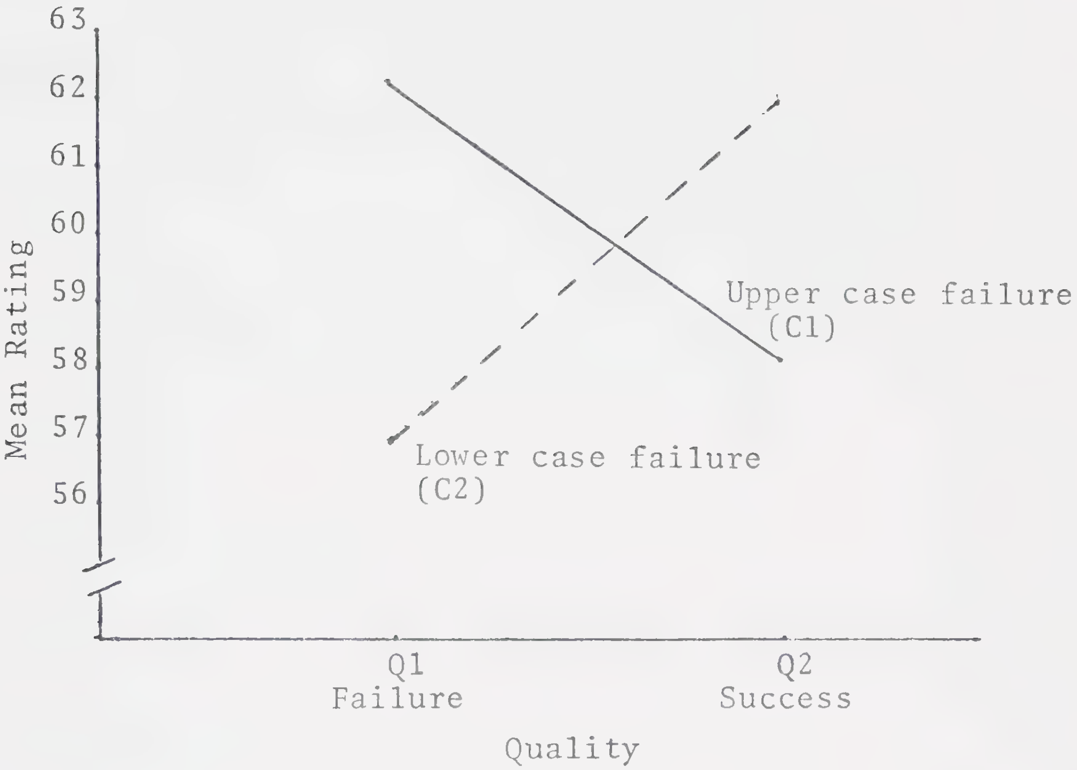

FIGURE 12

QUALITY X CASE (QC) INTERACTION, PART B RATINGS, ANALYSIS NUMBER 3 (N=48)

TABLE XIV

PROBABILITY LEVELS OF STATISTICALLY SIGNIFICANT RESULTS FOR ANALYSES NUMBER 1, 2, AND 3

Source	Analysis Number*		
	1	2	3
Part A Ratings:			
Q	.001	.001	.001
TQ	.001	.001	.001
TC	.001	NS	.05
Part A Performance:			
Q	.001	.001	.001
SQ	--	--	.05
TQ	.05	.05	.05
TSQ	--	--	.05
Part B Ratings:			
QC	NS	NS	.05
TQ	NS	.05	NS
Part B Performance:			
T	.05	NS	NS

* Analysis Number 1 included data for all subjects (N=64).
Analysis Number 2 included data only for subjects in which (Q1 - Q2) $\geq$ 10 on Part A Ratings (N=24).
Analysis Number 3 included data from Analysis Number 1, separated according to sex (N=48).

IV. CORRELATIONS

Tables XV, XVI, and XVII present the Pearson Product Moment Correlation Coefficients computed to determine whether the set inducing anagrams were related to perceived difficulty and performance on Trial 1 of Part B, as well as the t-values and probabilities associated with the resultant correlations.

Table XV, which presents the correlation coefficients associated with the data of the "good" group, shows that only one coefficient nears statistical significance: Prospective ratings of success anagrams were positively related to retrospective ratings of failure-type anagrams. The correlation regarding these two variables (.378) was higher than that for any of the others, suggesting that for subjects who obtained a prospective mental set, prospective success ratings were more influential than were prospective failure ratings in determining how all subsequent anagrams were to be retrospectively rated. This inference was given some support by the fact that prospective success ratings were also more highly correlated to retrospective success-type ratings (.325) than were prospective failure ratings (-.088).

None of the correlations resulting from the data of either the "bad" group (Table XVI) or the total group (Table XVII) were strong enough to approximate significance.

TABLE XV

CORRELATIONS, T-VALUES, AND PROBABILITY LEVELS FOR DATA OF "GOOD" GROUP (N=27)

		TRIAL 5, PART A	
		Failure Ratings	Success Ratings
TRIAL 1, PART B	Ratings on Failure-type Anagrams:		
	Correlation	.022	.378
	t-value of correlation	.111	2.040
	Probability level of t-value	.912	.052
	Ratings on Success-type Anagrams:		
	Correlation	-.088	.325
	t-value of correlation	-.422	1.721
	Probability level of t-value	.662	.098
	Performance on Failure-type Anagrams:		
	Correlation	-.025	-.129
	t-value of correlation	-.123	-.651
	Probability level of t-value	.903	.521
	Performance on Success-type Anagrams:		
	Correlation	-.025	-.011
	t-value of correlation	-.123	-.055
	Probability level of t-value	.903	.956

TABLE XVI

CORRELATIONS, T-VALUES, AND PROBABILITY LEVELS FOR DATA OF "BAD" GROUP
(N=37)

		TRIAL 5, PART A	
		Failure Ratings	Success Ratings
TRIAL 1, PART B	Ratings on Failure-type Anagrams:		
	Correlation	-.096	.218
	t-value correlation	-.571	1.321
	Probability level of t-value	.571	.195
	Ratings on Success-type Anagrams:		
	Correlation	-.092	.024
	t-value of correlation	-.549	.140
	Probability level of t-value	.587	.889
	Performance on Failure-type Anagrams:		
	Correlation	.172	-.231
	t-value of correlation	1.031	-1.402
	Probability level of t-value	.310	.170
	Performance on Success-type Anagrams:		
	Correlation	.145	-.162
	t-value of correlation	.867	-.970
	Probability level of t-value	.392	.339

TABLE XVII

CORRELATIONS, T-VALUES, AND PROBABILITY LEVELS FOR DATA OF TOTAL GROUP (N=64)

		TRIAL 5, PART A	
		Failure Ratings	Success Ratings
TRIAL 1, PART B	Ratings on Failure-type Anagrams:		
	Correlation	-.030	.198
	t-value of correlation	-.234	1.590
	Probability level of t-value	.816	.117
	Ratings on Success-type Anagrams:		
	Correlation	-.138	.218
	t-value of correlation	-1.094	1.763
	Probability level of t-value	.278	.083
	Performance on Failure-type Anagrams:		
	Correlation	.098	-.192
	t-value of correlation	.776	-1.538
	Probability level of t-value	.440	.129
	Performance on Success-type Anagrams:		
	Correlation	.125	-.199
	t-value of correlation	.994	-1.597
	Probability level of t-value	.324	.115

V. HYPOTHESIS NUMBER 1

The first hypothesis stated that subjects would prospectively rate failure anagrams higher in difficulty level than success anagrams, and was introduced to determine whether the students achieved a prospective mental set upon completion of Part A. From the discussion in Chapter I of Vargo's (1968) project, it will be recalled that his failure to include such a measure was a major weakness of the study.

In the present study this hypothesis was solidly supported by significant ($p < .001$) Quality main effects on Part A ratings for all three analyses (see Table XIV). The effect can also be seen in Figure 6.

VI. HYPOTHESIS NUMBER 2

The second hypothesis, predicting that more success than failure anagrams would be solved, was another measure of strength of expectancy or mental set. Verification of the hypothesis would manifest itself in a Quality main effect on Part A performance, as was the case (see Table XIV) for each analysis of variance. It is also demonstrated in the graphed interactions of Figures 7 and 11.

VII. HYPOTHESIS NUMBER 3

The third, and main, experimental hypothesis declared that subjects would retrospectively rate failure-

type anagrams as having been more difficult than success-type anagrams. For this hypothesis to be supported, the Quality main effect for Part B ratings must show Q1 to be significantly greater than Q2. However, as demonstrated in Tables III, VIII, and XII, the Quality main effect did not even approach significance for any of the three groups.

Although there was no overall main effect of Quality on Part B ratings, Figure 9, which graphically depicts the interaction of Trial x Quality for Analysis Number 2, suggests that the prospective mental set may have at least influenced retrospective ratings on Trial 1 of Part B (mean failure-type rating = 64; mean success-type rating = 52.5). If this were the case, one would expect significant correlations between the last failure rating on Part A and the first failure-type rating on Part B, and between the last success rating on Part A and the first success-type rating on Part B. However, for the "good" group these correlations are only .022 ($p = .912$) and .325 ($p = .098$) respectively, for the "bad" group -.096 ($p = .571$) and .024 ($p = .889$) respectively, and for the total group -.030 ($p = .816$) and .218 ($p = .083$) respectively (Tables XV, XVI, and XVII). Coefficients this low suggest that perhaps prospective mental set had little influence on retrospective ratings even for Trial 1 of Part B.

VIII. HYPOTHESIS NUMBER 4

The last hypothesis, predicting that more success-type than failure-type anagrams would be solved, was yet another way of saying that experience on Part A would influence retrospective perception and subsequent performance on Part B. However, the F ratios for Quality shown in Tables IV, IX, and XIII clearly indicate that such did not occur, so do the correlation coefficients between prospective success ratings on Trial 5 of Part A and performance on success-type anagrams on Trial 1 of Part B (Tables XV, XVI, and XVII), as do those between prospective failure ratings on Trial 5 of Part A and performance on failure-type anagrams on Trial 1 of Part B (Tables XV, XVI, and XVII).

CHAPTER IV

DISCUSSION AND SUMMARY

The results obtained in this study strongly substantiate Feather's finding (1961, 1966, 1968) that manipulation of relative success in a task will influence perceived probability of success in future tasks of a similar kind. However, they clearly did not support the main experimental hypothesis that subjects would retrospectively perceive a failure-type task as having been more difficult than a success-type task.

Neither ratings nor performance on Part A seemed to have much effect on retrospective ratings for Part B. What did seem to account for the Part B ratings, though, was performance on Part B.

Consider the correlation coefficients presented in Tables XVIII to XXI.

Notice that the negative correlations between performance and ratings for the "good" group (subjects demonstrating a prospective mental set) are, in general, lower than those for the "bad" group (students not showing a mental set) for both the success-type and the failure-type anagrams. This difference in correlations is seen particularly in the first few trials, suggesting that perhaps initially those subjects displaying a mental set were less influenced by the immediate test anagram situation

TABLE XVIII

CORRELATIONS BETWEEN RATINGS AND PERFORMANCE ON SUCCESS-TYPE ANAGRAMS FOR "GOOD" GROUP

Trial	Correlation	Probability
1	-.683	.000
2	-.499	.008
3	-.748	.000
4	-.708	.000
5	-.781	.000
6	-.833	.000
7	-.824	.000
8	-.753	.000
9	-.495	.009
10	-.659	.000

TABLE XIX

CORRELATIONS BETWEEN RATINGS AND PERFORMANCE ON FAILURE-TYPE ANAGRAMS FOR "GOOD" GROUP

Trial	Correlation	Probability
1	-.738	.000
2	-.835	.000
3	-.732	.000
4	-.740	.000
5	-.761	.000
6	-.736	.000
7	-.742	.000
8	-.817	.000
9	-.660	.000
10	-.852	.000

TABLE XX

CORRELATIONS BETWEEN RATINGS AND PERFORMANCE ON SUCCESS-TYPE ANAGRAMS FOR "BAD" GROUP

Trial	Correlation	Probability
1	-.725	.000
2	-.835	.000
3	-.868	.000
4	-.869	.000
5	-.641	.000
6	-.703	.000
7	-.710	.000
8	-.861	.000
9	-.778	.000
10	-.719	.000

TABLE XXI

CORRELATIONS BETWEEN RATINGS AND PERFORMANCE ON FAILURE-TYPE ANAGRAMS FOR "BAD" GROUP

Trial	Correlation	Probability
1	-.888	.000
2	-.792	.000
3	-.777	.000
4	-.832	.000
5	-.622	.000
6	-.803	.000
7	-.729	.000
8	-.816	.000
9	-.847	.000
10	-.815	.000

than were those who possessed no such set; i.e. a primacy effect seemed relatively stronger for the former, while a recency effect appeared relatively more influential for the latter. From such an inspection of Tables XVIII to XXI it might be assumed that the prospective mental set developed in Part A did exert some effect on the initial trials of Part B but was overpowered by the immediate stimulus afforded by the test anagrams.

One unexpected finding was that anagrams presented in upper case type appeared to be more difficult than those offered in lower case type. (Figure 12 reflects this phenomenon for Part B ratings.) This suggests that a study designed to determine whether there is something intrinsically more difficult about capital letters would be useful. For example, the conclusions of the present investigation would be questioned if it could be shown that the effects of upper vs. lower case are more powerful than the effects of failure vs. success.

Although this study does not present sufficient evidence to support the hypothesis that prospective mental set influences retrospective perception of task difficulty, it should not be concluded from this lack of evidence that prospective mental set definitely does not affect retrospective perception. In this regard it should be remembered that in each of Feather's researches (1961, 1966, 1968) two different groups of subjects were used, one group

receiving success anagrams, the other group getting failure anagrams. In the present study, on the other hand, all students received all four types of anagrams (success, failure, success-type, failure-type). Consequently, subjects in this study had to shift from success to failure and from success-type to failure-type, and perhaps this shifting in perception produced some uncontrolled-for effects which might have masked the hypothesized phenomena. Therefore, a future study of this nature might be more revealing if one group of subjects was given the success pretest anagrams and the success-type test anagrams, while a second group of subjects attempted the failure pretest anagrams, then the failure-type test anagrams.

I. SUMMARY

The present study employed two groups of high school students: a criterion group (N=49), and a test group (N=68). The criterion group were given a set of sixty five-letter anagrams ranging in difficulty from very easy to very difficult. Their task was to solve each anagram within a twenty-second time period. From these sixty anagrams, thirty-two (6 easy, 6 difficult, and 20 moderate) were chosen to be administered to the test group.

The second part of the study was divided into two parts: Part A, and Part B.

In Part A each student in the test group was given a booklet containing the six easy and six difficult anagrams. For one half of the students the easy anagrams were typed in capital letters, the difficult anagrams in small letters; for the other half, the easy anagrams were typed in small letters and the difficult anagrams in capital letters. Before attempting each anagram the students were told "The next one is printed in capital letters", or "The next one is printed in small letters", as was the case. With only this information to guide them, the participants were required to indicate on a rating scale (preceding each anagram in the booklet) what they thought their chances were of solving the next anagram. The purpose of this exercise was to induce a prospective mental set, i.e. one half of the students should have emerged from Part A with a mental set which, in effect, postulated that capital letter anagrams were easy and small letter anagrams were difficult, while the other half of the students should have had the idea that small letter anagrams were easy and capital letter anagrams were difficult.

In Part B the students were given the twenty moderately difficult anagrams, ten typed in capital letters and ten in small letters. Instructions were the same as for Part A except that the students rated each anagram for difficulty after completing it instead of estimating probability of success.

The major experimental hypothesis tested was that if mental set affects retrospective perception of task difficulty, then the students who were given the easy capital letter -- difficult small letter combination of anagrams should, in Part B, rate the capital letter anagrams as having been easier than the small letter anagrams; and similarly, those students given the difficult capital letter -- easy small letter combination should, in Part B, rate the capital letter anagrams as having been more difficult than the small letter anagrams.

Analyses of variance showed no statistical support for this hypothesis although clear substantiation was obtained for Feather's research reflecting the effect of past success and failure on perception of similar future tasks (measured by probability of success estimates). The results also suggested that perhaps anagrams presented in upper case type are intrinsically more difficult than those offered in lower case type.

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APPENDIX A

Criterion Group Anagrams

ANAGRAMS (IN ALPHABETICAL ORDER) ADMINISTERED TO CRITERION GROUP (SOLUTIONS IN PARENTHESES)

(1)	AABET	(ABATE)
(2)	ACDEL	(DECAL, LACED)
(3)	ACEHT	(CHEAT, TACHE TEACH)
(4)	ACHWT	(WATCH)
(5)	ACRTA	(CARAT)
(6)	ALBLS	(BALLS)
(7)	ALSST	(LASTS, SALTS, SLATS)
(8)	ARYLE	(EARLY, LAYER, RELAY)
(9)	AVERB	(BRAVE)
(10)	BOAVE	(ABOVE)
(11)	CACKR	(CRACK)
(12)	CEPAH	(CHAPE, CHEAP, PEACH)
(13)	CPLSA	(CLAPS, CLASP, SCALP)
(14)	CRLEU	(CRUEL, LUCRE, ULCER)
(15)	EEGRA	(AGREE, EAGER, EAGRE)
(16)	EFRAS	(FARES, FEARS, SAFER)
(17)	EHORS	(HORSE, SHORE)
(18)	EHRAS	(HARES, HEARS, RHEAS, SHARE, SHEAR)
(19)	ETAMS	(MATES, MEATS, STEAM, TEAMS)
(20)	FELMA	(FLAME)
(21)	GHMIT	(MIGHT)
(22)	HEDAT	(DEATH, HATED)
(23)	HOTRN	(NORTH, THORN)
(24)	ILNVY	(VINYL)

(25)	ILPLS	(PILLS, SPILL)
(26)	INPSS	(SNIPS, SPINS)
(27)	JLOYL	(JOLLY)
(28)	JPMSU	(JUMPS)
(29)	KADSE	(ASKED)
(30)	KBADE	(BAKED)
(31)	DBRAE	(BAKER, BRAKE, BREAK)
(32)	LMSUP	(LIMPS, PLUMS, SLUMP)
(33)	LOPTI	(PILOT)
(34)	MAPST	(STAMP, TAMPS)
(35)	MLCIA	(CLAIM)
(36)	MRADE	(DREAM)
(37)	NELNI	(LINEN)
(38)	NIAST	(SAINT, SATIN, STAIN)
(39)	NIGSR	(GRINS, RINGS)
(40)	OCLDU	(CLOUD, COULD)
(41)	OMRYA	(MAYOR, MORAY)
(42)	PAELT	(LEAPT, PELTA, PETAL, PLATE, PLEAT)
(43)	RABED	(BARED, BEARD, BREAD, DEBAR)
(44)	RDCOW	(CROWD)
(45)	RECDA	(CADRE, CEDAR, RACED)
(46)	RULAN	(LUNAR, ULNAR)
(47)	RUSTT	(STRUT, TRUST)
(48)	SAEFL	(FALSE, FLEAS)
(49)	SLGIL	(GILLS)
(50)	SNITP	(PINTS)

(51)	SROEB	(BORES, BROSE, ROBES, SOBER)
(52)	TDAEC	(ACTED, CADET)
(53)	TFIRU	(FRUIT)
(54)	THRIG	(GIRTH, RIGHT)
(55)	TRIVE	(RIVET)
(56)	TSANP	(PANTS)
(57)	UPLIP	(PUPIL)
(58)	WLOEB	(BELOW, BOWEL, ELBOW)
(59)	WRABN	(BRAWN)
(60)	YENBO	(EBONY, BONEY)

APPENDIX B

Set Inducing Anagrams

Test Anagrams

Part A Rating Scale

Part B Rating Scale

SET INDUCING ANAGRAMS

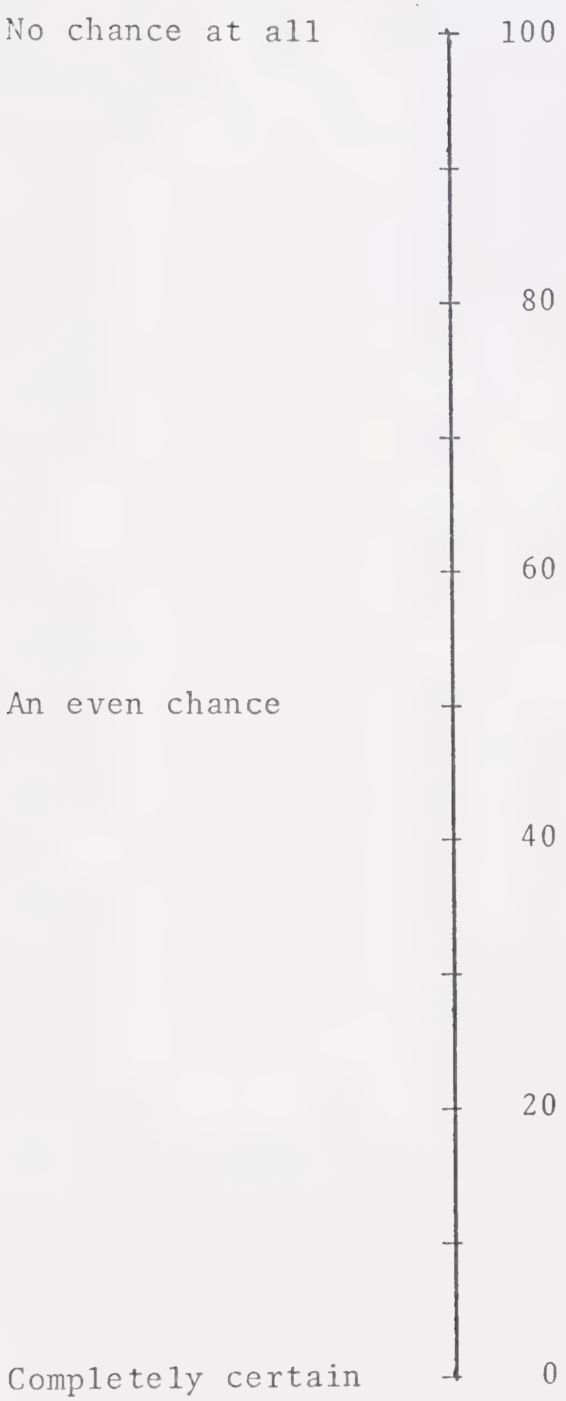
SUCCESS ANAGRAMS:	DIFFICULTY LEVEL (%)
(1) EHORS	20.41
(2) ETAMS	16.33
(3) ILPLS	20.41
(4) JPMSU	14.29
(5) KBRAE	14.29
(6) RUSTT	14.29

FAILURE ANAGRAMS:	DIFFICULTY LEVEL (%)
(1) AABET	95.92
(2) ACRTA	97.96
(3) FELMA	93.88
(4) KADSE	97.96
(5) LOPTI	93.88
(6) OMYRA	100.00

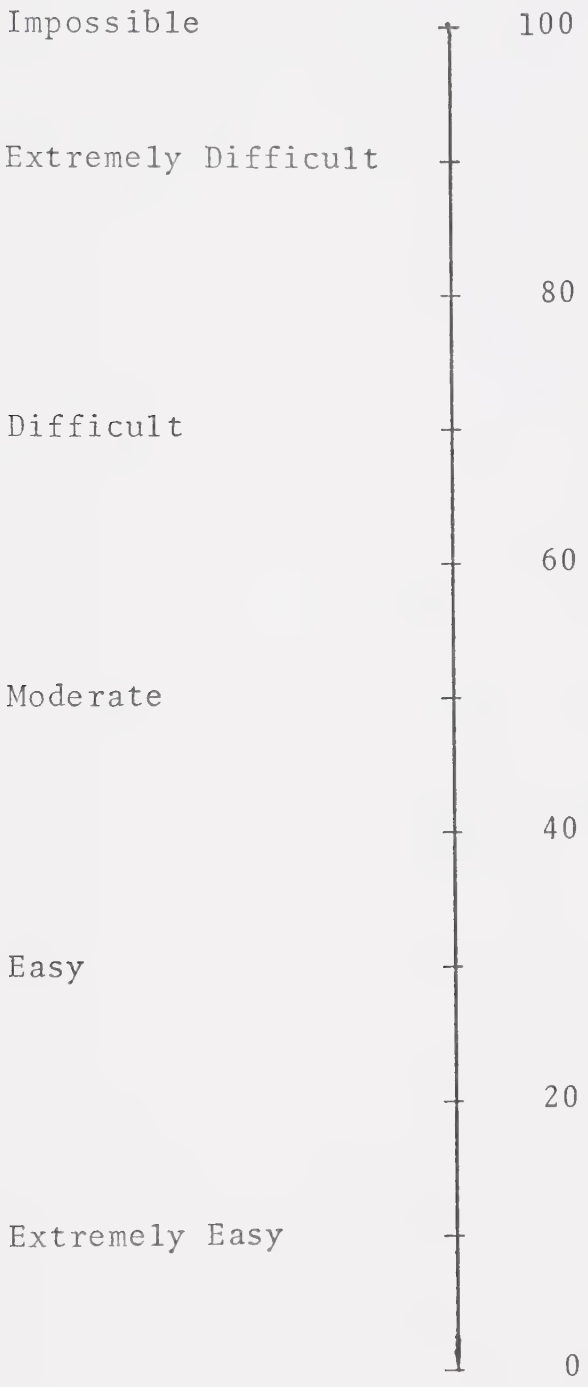
TEST ANAGRAMS

ANAGRAM:	DIFFICULTY LEVEL (%)
(1) ACEHT	67.35
(2) ACHWT	55.10
(3) ALSST	46.94
(4) BOAVE	71.43
(5) CEPAH	71.43
(6) CPLSA	61.22
(7) EHRAS	48.98
(8) HEDAT	57.14
(9) HOTRN	55.10
(10) JLOYL	61.22
(11) KBADE	69.39
(12) NIGSR	65.31
(13) PAELT	71.43
(14) RABED	48.98
(15) RDCOW	65.31
(16) THRIG	48.98
(17) TRIVE	57.14
(18) TSANP	48.98
(19) WRABN	61.22
(20) YENBO	71.43

RATING SCALE: PART A



RATING SCALE: PART B



APPENDIX C

Mean Prospective Rating Scores for Subjects Attaining a Mental Set on Part A

MEAN PROSPECTIVE RATING SCORES FOR SUBJECTS ATTAINING A MENTAL SET ON PART A

SUBJECT	MEAN FAILURE RATING	MEAN SUCCESS RATING
1	54.0	24.0
2	52.0	34.0
3	62.0	44.0
4	80.0	22.0
5	82.0	50.0
6	62.0	48.0
7	52.0	32.0
8	82.0	72.0
9	74.0	30.0
10	58.0	46.0
11	54.0	44.0
12	78.0	22.0
13	66.0	42.0
14	80.0	70.0
15	94.0	38.0
16	72.0	24.0
17	66.0	28.0
18	96.0	12.0
19	70.0	26.0
20	64.0	32.0
21	80.0	36.0
22	74.0	50.0
23	68.0	32.0
24	60.0	20.0

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